I claim:

1. An adaptive optics control system for distorted optical wavefronts, comprising:

a wavefront corrector having a surface controlled by a plurality of actuators;

a wavefront slope sensor having subaperture separation means for defining a plurality of subapertures through which the distorted wavefront can pass, each subaperture corresponding to each actuator of the wavefront corrector, the wavefront slope sensor being adapted to measure the wavefront slope through each subaperture and generate a wavefront slope sensor output signal for each subaperture indicative of the distortion of the wavefront;

a wavefront reconstructor adapted to receive the wavefront slope sensor output signals and calculate a phase estimate for each of the actuators of the wavefront corrector, the phase estimate having a signal-to-noise ratio, the wavefront reconstructor being further adapted to generate a plurality of correction signals, each having a bandwidth, based on said phase estimates; and

a wavefront controller adapted to selectively adjust the bandwidth of each correction signal based on the signal-to-noise ratio of the estimated phase calculated by the wavefront reconstructor.

2. The system of claim 1, wherein the wavefront controller is adapted to reduce the bandwidth of the correction signals for actuators having corresponding phase estimates with a low signal-to-noise ratio, and increase the bandwidth of the correction signals for actuators having corresponding phase estimates with a high signal-to-noise ratio.

3. The system of claim 2, wherein the correction signals associated with low signal-to-noise

ratios comprise correction signals associated with signal-to-noise ratios less than a first value and the correction signals associated with high signal-to-noise ratios comprise correction signals associated with signal-to-noise ratios greater than a second value.

4. The system of claim 3, wherein the first value is 5, and the second value is 10.

5. The system of claim 1, wherein the bandwidth of each correction signal is proportional to the signal-to-noise ratio of the corresponding estimated phase.

6. The system of claim 1, wherein the wavefront reconstructor comprises at least one microprocessor.

7. The system of claim 1, wherein the wavefront corrector comprises a deformable mirror.

8. The system of claim 1, wherein the wavefront corrector comprises a spatial light modulator.

9. The system of claim 1, wherein the subaperture separation means comprises an array of lenslets and a corresponding detector array having a plurality of pixels disposed behind each lenslet, each lenslet defining a subaperture.

10. The system of claim 1, wherein the subaperture separation means comprises a lateral shearing interferometer.

11. The system of claim 1, wherein the wavefront slope sensor comprises means for individually calibrating each wavefront slope measured by the wavefront slope sensor.

12. A method of optical wavefront distortion correction using a wavefront corrector having a surface controlled by a plurality of actuators, the method comprising:

measuring the distortion of the wavefront with a wavefront slope sensor having subaperture separation means for defining a plurality of subapertures through which the distorted

wavefront can pass, each subaperture corresponding to each actuator of the wavefront corrector, the wavefront slope sensor being adapted to measure the wavefront slope through each subaperture and generate a wavefront sensor output signal for each subaperture indicative of the distortion of the wavefront;

calculating a phase estimate for each of the actuators of the wavefront corrector based on the wavefront sensor output signals, each phase estimate having a signal-to-noise ratio;

generating a plurality of correction signals to be applied to each actuator based on the phase estimates, each correction signal having a bandwidth; and

selectively adjusting the bandwidth of each correction signal based on the signal-to-noise ratio of the corresponding estimated phase.

13. The method of claim 12, wherein the step of selectively adjusting comprises adjusting the bandwidth of each correction signal to be proportional to the signal-to-noise ratio of the corresponding estimated phase.

14. The method of claim 12, further comprising:

reducing the bandwidth of correction signals of actuators having corresponding phase estimates with a low signal-to-noise ratio; and

increasing the bandwidth of correction signals of actuators having corresponding phase estimates with a high signal-to-noise ratio.

15. The method of claim 14, wherein the correction signals associated with low signal-to-noise ratios comprise correction signals associated with signal-to-noise ratios less than a first value, and the correction signals associated with high signal-to-noise ratios comprise the correction signals associated with signal-to-noise ratios greater than a second value.

16. The method of claim 15, wherein the first value is 5, and the second value is 10.

17. The method of claim 12, further comprising individually calibrating each wavefront slope measured by the wavefront slope sensor.

18. The method of claim 12, wherein the step of calculating a phase estimate comprises representing the wavefront corrector and wavefront slope sensor measurements as a plurality of linear equations in a matrix format.

19. The method of claim 12, wherein the subaperture separative means comprises an array of lenslets and a corresponding detector array having a plurality of pixels disposed behind each lenslet, each lenslet defining a subaperture.

20. The method of claim 12, wherein the subaperture separation mechanism comprises a lateral shearing interferometer.